

Refractive Errors in Thalassemia Patients

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ABSTRACT

Purpose: The objective of this study was to evaluate the frequency of refractive error among thalassemia patients.

Methodology: This cross sectional study was performed in duration of six months at Sir Ganga Ram hospital from July, 2023 to August, 2023. A total of hundred (n=100) thalassemia patients, were included in this study between the age range of 17 to 30 years. All subjects with thalassemia were previously diagnosed. Objective refraction was accomplished with Auto-Refractometer (Axis), and vision was examined with Snellen chart/Log Mar chart. SPSS version 26 was used to analyze the results. Chi-Square test was applied to find the significance of data. P-value <0.05 was considered as significant.

Results: The mean age of participants was 21.28±3.39 years. In the right eye of thalassemia patients, the result showed that 51% were emmetropic, 11% had hyperopia, 1% had hyperopic astigmatism, 20% had myopia, and 17% had myopic astigmatism. In the left eyes of patients, 52% were emmetropic, 10% had hyperopia, 2% had hyperopic astigmatism, 18% had myopic astigmatism, and 18% had myopia. P-value was 0.043.

Conclusion: The cross sectional study results conclude that patient's vision may not be significantly affected by thalassemia. Thalassemia patients were more effected with Myopia. While hyperopic astigmatism was least effected.

Keywords: Emmetropia, Hyperopia, Hyperopic Astigmatism, Myopia, Myopic Astigmatism, Thalassemia.

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INTRODUCTION

Refractive error is a type of vision problem that makes it difficult to see. According to WHO, uncorrected refractive problems (myopia, hypermetropia, and astigmatism) are to blame for 43% of visual impairment. There are 19 million blind children under the age of 15, 12 million of which are thought to be the result of untreated refractive defects.¹ Nearby objects appear blurry but faraway objects appear clear when you have Hyperopia. Instead of focusing on the retina, it makes light focus behind it. Although accommodation might result in clear vision, it also causes eye strain over time.² Refractive error can cause vision impairment in up to 43% of people. Pakistan's visually impaired people have 11.4% uncorrected refractive errors.³

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Astigmatism is a common refractive defect caused by a meridional misalignment in the spherical shape of the eye which produces asymmetric bending of light rays.⁴ Astigmatism that is left untreated can also cause myopia to develop or worsen. The age range of 6 to 15 years has not been the subject of many studies internationally. Most of these studies show that astigmatism occurs less frequently than 25% of the time.⁵ In emmetropic eyes, tiny astigmatism that would normally be caused by the cornea is balanced out by an astigmatism that would normally be induced by the lens. If it develops early, amblyopia might be a factor.⁶ Thalassemia is the inherited (i.e., passed out by genes from parents to children) disorder which caused when the body produces insufficient amounts of hemoglobin, a crucial component of red blood cells.⁷ A study was conducted in 2022 by Sehar Khaliq projected that there are more than 10 million carriers of thalassemia in Pakistan, where the prevalence of the trait is between 5.0 and 7.0.⁸ Thalassemia, the most widespread genetic hemoglobinopathies globally, occurs in approximately 4.4 out of 10,000 live births.⁹ A Globin chain and Heme (Fe++) attachment work together to transfer oxygen trans-Globin chains. There is a group of alpha and beta protein-coding genes on chromosomes 16 and 11, respectively.¹⁰

A severe condition of thalassemia is known as alpha thalassemia. Although it generally results in death before birth, the development of in-utero transfusions has allowed an increasing percentage of children to survive.¹¹ Thalassemia causes no symptoms. Alpha thalassemia major causes hydrops fetalis and frequently leads to infant death at birth. Beginning in early childhood lifelong transfusions are needed for beta thalassemia major.¹²

A diverse set of hereditary hemoglobinopathies known as beta thalassemia are distinguished by abnormalities in the beta-globin chain of hemoglobin and autosomal recessive inheritance.¹³ Studies on individuals with thalassemia have revealed significant alterations in ocular characteristics, such as shorter axial length, a steeper cornea, lower visual acuity, bigger lenses, and refractive errors particularly astigmatism are

more common.¹⁴ The purpose of this research was to figure out how frequently thalassemia youngsters experience refractive error.

METHODOLOGY

Ethical approval was granted by Research Committee of University of Lahore vide no. REC/UOL/220-3-24. This cross sectional study included 100 thalassemia patients (male and female) and was conducted from July, 2023 to August, 2023 at Sir Gangaram Hospital. Before data collection, we informed patients about the pros and cons of research. Subjects who fulfilled the inclusion criteria were selected for convenient random sampling after obtaining informed consent. First, a medical history was obtained to rule out any metabolic diseases, autoimmune conditions, and systemic disorders by asking about previous ocular and medical history. Refractive error assessment of subjects with thalassemia was done. Refractive errors in selected subjects were measured with the help of autorefractometer in objective refraction. While subjective refraction was done by using trial box and trial frame. Visual acuity of selected subjects was done by using Snellen chart and Log MAR chart. SPSS version 26 was used to analyze the results. Chi-Square test was applied to find the significance of data. P-value <0.05 was considered as significant.

RESULTS

Table - 1: Age Distribution of Study Participants

Age	Minimum Value	Maximum Value	Mean ± S.D
17 - 30	17	29	21.28 ± 3.39

This table depicts minimum value & maximum value of age of study participants with mean and standard deviation of 21.2±3.39.

Table- 2. Gender Distribution of Study Participants.

Gender Distribution	Frequency (n)	Percentage %
Female	34	34.0 %
Male	66	66.0 %
Total	100	100.0 %

This table depicts the gender distribution of study participants, male percentage was more than females that was 66% and 34% respectively.

Table - 3. Distribution of Refractive Errors in Right Eyes of Study Participants.

Refractive Errors	Frequency (n)	Percentage %	P-Value
Emmetrope	51	51.0 %	0.043
Myopia	20	20.0 %	
Myopic Astigmatism	17	17.0 %	
Hyperopia	11	11.0%	
Hyperopic Astigmatism	1	1%	
Total	100	100.0%	

Chi-square test was applied to find the significance of data. P-value 0.05 was considered as significant.

Table - 4. Frequency Distribution of Refractive Errors in Left Eyes of Study Participants.

Refractive Errors	Frequency (n)	Percentage %	P-Value
Emmetrope	52	52.0 %	0.043
Myopia	18	18.0 %	
Myopic Astigmatism	18	18.0	
Hyperopia	10	10.0%	
Hyperopic Astigmatism	2	2.0%	
Total	100	100.0%	

Myopia was most prevalent refractive error among our study participants. Chi-square test was applied to find the significance of data. P-value 0.05 was considered as significant.

DISCUSSION

In our research we had total 100 participants. This data was collected from Sir Ganga Ram Hospital. Mean age of the subjects were 21 years. In this study, we had male participants more than female participants that were 66% and 34% respectively. In previous similar study, refractive error measured in beta thalassemia patients and control patients. In this study, total of 71 patients were included in which 52% were female and 48% were male. According to this study results, 68% patients were hyperopic and 25% patients were myopic whereas in aged matched control groups 90% were Myopia and 0.83% were hyperopia. While in our study 51.5% were emmetropic and 48.5% were ametropic. Myopia were 18% and hyperopia were 10.5%.

Another study was carried out in 2021 to asses' retinal abnormalities with significant thalassemia and their co relation risk factor. In this prospective study 120 subjects with thalassemia underwent an

eye examination using fundus auto fluorescein imaging and fundus photography. They also examined BCVA, contrast sensitivity, and color vision. Systemic risk factors such as age hemoglobin level, and ferritin level were also observed. They concluded that older age and higher ferritin level were identified to be risk factor for thalassemia related retinal abnormalities.¹⁵

From February, 2020 to August, 2021, this study was conducted at North Bengal medical college and Hospital of Department of Ophthalmology. In this study, 75 patients with beta thalassemia were analyzed. According to study, only 6.7% of study participants had emmetropia, 69.66% had hypermetropia, 38.66% had Myopia and 45.33% had astigmatism while 93.3% of participants had refractive abnormalities. When we compared this study to our study, myopia was greater than hypermetropia.¹⁶

Elkitkat and associates¹⁷ Compared one hundred children having thalassemia with one hundred typically developing peers. Compared to controls, children with thalassemia were shorter and lighter, with a smaller BMI ($p < 0.001$). Regarding ocular biometric data, patients with thalassemia had steeper mean K readings ($p = 0.03$), shorter axial length (AXL) ($p = 0.005$). Patients with thalassemia had a significant myopic shift ($p = 0.003$). Aksoy A and colleagues¹⁸ also compared thalassemia children with healthy controls and concluded that thalassemia children have comparatively reduced visual acuity which was statistically significant. Similarly changes in schirmer test scores were also statistically significant.

Nuzzi R et al¹⁹ assessed visual functions in patients of thalassemia after long term iron therapy with iron chelating agents. In their research, Logistic regression returned a statistically significant correlation between myopia and iron chelation therapy (p -value 0.04; OR 1.05) and also between presbyopia and total duration of therapy with iron chelating agent (p -value 0.03; OR 1.21). Heydarian S et al compared refractive errors between patients of beta thalassemia major and age matched controls. They found prevalence of myopia, Hyperopia, and emmetropia among thalassemia patients to be 16.7,

19.4, and 63.9 %, respectively. While in the control group, 26.9 % were myopic, 25 % were hyperopic, and 48.1 % were emmetropic.

Patient's sample was obtained from single hospital and only refractive errors were measured. Multicentre studies featuring extensive data collection on ocular biometric measurements will further improve the findings.

CONCLUSION

Patient's vision may not be significantly affected by thalassemia. Thalassemia patients are more effected with myopia, while hyperopic astigmatism is least prevalent.

Conflict of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Board / Ethical Review Board Vide No.REC.UOL/220/03/2024..

Author Contributions: Sibgha Naseem: Concept, Design, Literature Review.

Zunaira Rasool: Data Collection, Literature Review.

Laiba Naseer: Data Collection, Literature Review.

Iqra Nawaz: Data Analysis, Article Draft.

Zoya Jamshaid: Data Analysis, Critical Review.

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